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**Soil quality — Preparation of laboratory  
samples from large samples**

*Qualité du sol — Préparation des échantillons de laboratoire à partir  
d'échantillons de grande taille*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 23909 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 3, *Chemical methods and soil characteristics*.

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## Introduction

The existing International Standards on pretreatment (ISO 11464, ISO 14507 and ISO 16720) are based on a laboratory sample of approximately 1 kg. Such a sample is considered representative if the maximum size of the particles is 8 mm (in accordance with Table A.1). The representivity also depends on other factors, like an adequate sampling strategy. The mentioned International Standards describe methods to mix and divide and reduce the particle-size, in order to provide a representative test sample. For volatiles, ISO 14507 provides a procedure for taking a test sample. The other specified pretreatment methods will result in a significant loss of the contaminant.

This International Standard connects samples taken in accordance with ISO 10381-8 and other methods where large samples are obtained with the International Standards concerning pretreatment ISO 11464, ISO 14507 and ISO 16720. This International Standard is defined for samples up to typically 25 kg, but is basically also applicable to considerably larger samples.

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# Soil quality — Preparation of laboratory samples from large samples

## 1 Scope

This International Standard specifies a method for the preparation of laboratory samples from large samples. In accordance with ISO 11464 and ISO 14507, the following analyses are considered:

- determination of physico-chemical parameters;
- determination of moderate volatile organic contaminants;
- determination of non-volatile contaminants.

This International Standard is not applicable when volatile organic compounds have to be analysed.

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## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10381-8:2006, *Soil quality — Sampling — Part 8: Guidance on sampling of stockpiles*

ISO 11464, *Soil quality — Pretreatment of samples for physico-chemical analysis*

ISO 14507:2003, *Soil quality — Pretreatment of samples for determination of organic contaminants*

ISO 16720, *Soil quality — Pretreatment of samples by freeze-drying for subsequent analysis*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1 analytical sample

sample, prepared from the laboratory sample, from which test portions are removed for testing or analysis

[ISO 11074:2005]<sup>[3]</sup>

### 3.2 laboratory sample

sample intended for laboratory inspection or testing

**3.3**  
**moderately volatile compounds**

sum of moderately volatile organic compounds and volatile inorganic compounds (e.g. mercury, arsenic, cadmium, thallium) that can be lost during sample preparation (e.g. heating)

**3.4**  
**moderately volatile organic compounds**

organic compound having a boiling point above 300 °C (at a pressure of 101 kPa)

NOTE This definition includes mineral oil, most polycyclic aromatic hydrocarbons (PAH) (see Reference [4]), polychlorobiphenyls (PCB) (see Reference [2]), organochlorine pesticides (see Reference [2]).

[ISO 14507:2003]

**3.5**  
**sample**

subset of a population made up of one or more sampling units

NOTE Many different ways, random and not random, of selecting a sample can be envisaged. A collection of data obtained by biased sampling that is unavoidable in many areas (e.g. in human genetics, of families detected through abnormal children), is also a sample. In survey sampling, sampling units are often selected with a probability proportional to the size of a known variable, giving a biased sample.

[ISO 3534-2:2006]<sup>[1]</sup>

**3.6**  
**sample division**

(bulk material) activity in sample preparation whereby a sample of bulk material is divided by such means as riffing, mechanical division, or quartering into separate parts, one or more of which is retained

[ISO 3534-2:2006]<sup>[1]</sup>

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**3.7**  
**subsample**

selected part of a sample

NOTE The subsample can be selected by the same method as was used in selecting the original sample, but need not be so.

[ISO 3534-2:2006]<sup>[1]</sup>

**3.8**  
**volatile organic compounds**

organic compound having a boiling point below 300 °C (at a pressure of 101 kPa)

NOTE This includes volatile aromatic and volatile halogenated hydrocarbons, as determined in accordance with ISO 15009<sup>[5]</sup>. Some mono- and dichlorophenols, for instance, and naphthalene also belong to this group.

[ISO 14507:2003]

## 4 Principle

A laboratory sample is prepared from a large sample obtained in the field by manual or automated division. The maximum particle size defines the minimum mass of the subsamples and, if necessary, the degree of size reduction.



## 5 Apparatus

In most methods of sample pretreatment, there is a risk that the final composition of the subsample(s) will differ from the composition of the original increments or sample. This can be due to the nature of the material or the method selected for sample division. Especially, the particle-size reduction is a potential source of large changes in the composition of samples, and is therefore (in principle) only allowed in a fully equipped pretreatment laboratory. Nevertheless, sample division can also result in significant changes in the composition of the material when no or inadequate precautions are taken. Examples include loss of moisture or volatile components due to evaporation and loss of fine particles due to air entrainment. When particle-size reduction is applied, contamination of the sample by abrasion or pick-up from the crushing surfaces, and oxidation of newly exposed surfaces, may also influence the sample integrity.

It is therefore preferable to choose a method of sample pretreatment that causes the minimum possible change in composition, particularly with respect to subsequent requirements of the material. For a description of the equipment used within this International Standard, see ISO 11464 and ISO 10381-8.

## 6 Procedure

### 6.1 General

Depending on the maximum size of soil aggregates, it is necessary to have a minimum amount of a sample that is representative of the site. This is described in Annex A (modified from ISO 10381-8). Following the procedure specified in ISO 10381-8, samples of several kilograms can be sent to the laboratory. To obtain the desired sample which is representative for analyses, it is necessary to mix and divide the sample as well as reducing the particle size, because methods of analysis are usually based on a test sample of less than 1 g and up to 50 g. Apart from large samples due to the maximum particle size of the soil material sampled, large samples can also occur due to the application of sampling strategies where large numbers of increments are put together in a composite sample.

### 6.2 Methods of sample division

In accordance with ISO 11464 and ISO 14507, the following analyses are considered:

- determination of physico-chemical parameters;
- determination of moderate volatile organic contaminants.

Whenever volatile components are to be determined, the process of sample pretreatment can result in a substantial loss of these components. Sample pretreatment shall be omitted in these cases by taking specific samples for the determination of volatile components. These samples shall be sealed directly after sampling, cooled and analysed as soon as possible after sampling.

The location for sample pretreatment shall be chosen and the location shall be made fit for use by cleaning it of all materials that can influence the integrity of the (sub)sample(s). When all preparations are ready, the sample pretreatment shall be carried out using the chosen technique.

Remove particles not relevant for the analyses, weigh and describe them. If the largest particle size within the laboratory sample is too big, a stone crusher or another crushing device can be used to reduce the maximum particle size before further reduction to 2 mm. Direct reduction of the particle size to less than 2 mm is only allowed if this does not influence the results. For moderate organic contaminants, losses will occur due to development of heat in such a step.

If it is not possible to reduce the maximum particle size to a value which can be processed by one of the described techniques, this shall be reported with the remark that it was not possible to obtain a representative subsample and the results shall be considered as indicative.